Mexican State Agency Reduces Donated Blood Wastage With RFID

Veracruz's health department has improved the visibility of the bags of blood products it sends to hospitals, by tracking their temperatures, locations and details, such as expiration dates.

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Dec 01, 2014—A radio frequency identification system deployed in Mexico's State of Veracruz has helped blood banks reduce the quantity of blood that is lost or wasted due to expiration, saving approximately 7 million pesos ($515,000) annually. The solution, which has been up and running since September 2013, enables the state's blood bank system to manage the locations of its blood bags as they are stored, transported and received at a given site, such as a blood center or hospital, and to track the temperature conditions for those bags. The system, provided by French company Biolog-ID, is being used at eight sites across eastern Mexico by the state's health department, Secretaria de Salud del Estado de Veracruz (SSAVER). The system employs passive high-frequency (HF) RFID tags and wireless temperature sensors.

The state collects blood from donors at a central blood center in the city of Veracruz, as well as at satellite centers, many located in hospitals. That blood is then separated into plasma, platelets and red cell products, which are placed into bags and quarantined during testing for pathogens. Once released from quarantine, the blood products are transported to hospitals as needed by specific patients. Not surprisingly, the products must be closely tracked throughout the entire process. Temperature control of the blood during its approximately 42-day shelf life ensures that the product remains safe. Finally, it is critical that blood types be properly identified, and that blood of a particular type is never administered to the wrong patient.

At the state blood transfusion center's cold storage room, five blood storage racks have been fitted with RFID readers and antennas.

The process of ensuring blood inventory accuracy has required that daily manual inventory counts be conducted within the blood centers' storage rooms, in which temperatures are kept at 4 degrees Celsius (39.2 degrees Fahrenheit). In fact, staff members must perform a full inventory of blood in storage following each eight-hour shift.

Biolog-ID developed its RFID-based blood-management system initially for the government in France, where it had been tested by the French Blood Institution—Etablissement Français du Sang (EFS). For the past two years, the Laboratoire Français du Fractionnement et des Biotechnologies (LFB) and Europlasma have been using Biolog-ID's system to track bags of blood plasma in France and Eastern Europe.

In the meantime, in July 2013, Biolog-ID began working with SSAVER in Mexico to establish the system in that country. After some preliminary testing was carried out, the system was fully installed at eight locations (SSAVER's chief blood center, six hospitals with their own blood centers, and a seventh hospital that receives blood from other sites), according to Dorian Morel, Biolog-ID's project manager and product specialist. At the state's primary blood center—the Centro Estatal de Transfusion Sanguinea (CETS)—Biolog-ID worked with Dometic, which manufactured the refrigerators used by SSAVER, to incorporate RFID readers and antennas into five storage racks already in use within the facility's refrigerated storage room. Biolog-ID also added an ultrahigh-frequency (UHF) transmitter to each rack's temperature sensor. Combined, the five storage racks are capable of accommodating 1,050 bags of blood at any given time. .

Biolog-ID added RFID readers to Dometic refrigerators that were already in operation at six other hospital blood centers, and at SSAVER's Hospital Regional de Alta Especialidad de Veracruz, which receives blood products to administer to patients, but does not accept blood donations. Biolog-ID also added a UHF radio to each refrigerator's built-in temperature sensor, so that the blood centers could use a wireless modem to collect temperature readings and upload that information to Biolog-ID's cloud-based BiologSCS software.

When blood is drawn from a donor, it is placed into a bag and assigned a serial number that is paired with data about that donor, as well as the date and location. A bar-coded label, with the donation's ID number printed on it, is attached to that bag as the blood is drawn. It can then be processed at the lab, and be stored in quarantine until the testing results arrive after several hours, or a day or more. Although SSAVER could eventually apply RFID tags at the time of donation, Morel says, the bar-code technology is sufficient for tracking the product prior to quarantine release.

Once the blood is released from quarantine, a staff member prints a passive high-frequency (HF) 13.56 RFID label compliant with the ISO 15693 standard, and containing 2 kilobytes of memory, and applies it to the bag. Biolog-ID declines to name the tag provider. At the time of printing, data is written to the tag, and is also stored in Biolog-ID's cloud-based BiologSCS software, including the blood type and the donation serial number linked in SSAVER's own software to the donor's identity and blood-test results.

Because each donation site and hospital has its own management software, the Biolog-ID system writes the data on the tag in order to ensure that reading it will provide the necessary information to anyone at a location other than where the blood was first tagged. Biolog-ID's cloud-based software also receives the data and forwards the read event, along with information written to the tag, to SSAVER's software at that site.

The RFID-tagged blood is then moved to a refrigerated storage room, where it is placed in one of the storage racks, each of which has multiple drawers, with up to 15 compartments in each drawer. Each space has a built-in antenna wired to a Biolog-ID HF reader. The storage unit's reader captures the ID number and other data encoded to the blood bag's RFID tag, which is installed underneath the bag's printed label, thereby linking that bag to that location within the storage unit.

When an order for a specific blood bag is received, staff members can use the Biolog-ID software to pinpoint that bag's exact location—a process that is more efficient than the manual method of reading text printed on the bag's label, or scanning its bar-coded ID number.

The blood bags are then packed in a cooling container for transportation either to another blood center or to a particular patient. A battery-powered Biolog-ID temperature data logger, measuring 72 millimeters by 60 millimeters by 18 millimeters (2.8 inches by 2.4 inches by 0.7 inch), is placed inside the container, while an HF RFID tag on the container identifies it. Once the blood bags are packed, an employee uses a handheld Biolog-ID reader to link the bags with the container, and utilizes a wireless modem plugged into a computer to download the temperature reading from the sensor. When the boxes are received at the hospital, a worker can employ a Biolog-ID handheld unit to read their tags in order to confirm what has been received, and use a wireless modem to view the blood's temperature history.

When the patient is ready to receive the blood, a staff member removes the designated bag from the hospital's RFID-enabled Biolog-ID refrigerator and accesses the cloud-based BiologSCS software to check the bag's temperature history readings, confirm that it is not set to expire, and make sure it is the correct blood type for that patient. This procedure provides redundancy, ensuring that no errors are made prior to a transfusion. The blood is then delivered to the patient's bedside.

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CETS' Mónica Nuñez Morales

Although nurses are not equipped with handheld readers, Morel says, they may be in the future, so that a nurse could read the RFID tags embedded in her own staff badge and her patient's wristband, as well the blood tag, to enhance transfusion safety and create a record of when the blood was administered, to what patient and by what employee.

For blood centers, the greatest savings comes from reduced labor costs, while for both hospitals and the blood centers, another key benefit is improved product safety, resulting from being able to better track a blood product's temperature and expiration status. In addition, hospital workers can use the system to determine which products are located at which SSAVER site, thereby enabling them to order a blood product they require without having to make phone calls to ascertain what is available.

Veracruz CETS health officer Mónica Nuñez Morales says the technology has increased the visibility and accuracy of data related to each unit's temperature, location and expiration dates. That, she adds, has reduced the waste of product that might otherwise have been discarded due to its having expired, its temperature having exceeded a specified threshold (as indicated by the temperature data retrieved from the sensors), or the unit simply not having been found when needed.

In the long term, Nuñez Morales reports, SSAVER will continue to track blood products from the point at which they are removed from quarantine, to their eventual arrival at a patient's bedside. As such, she says, the agency will strive to implement the RFID system at other SSAVER hospitals and blood-collection sites throughout the State of Veracruz.